-- 18. The method of claim 1, wherein the plasma comprises between about 25% and about 75% by volume of argon.

19. The method of claim 8, wherein the plasma comprises between about 25% and about 75% by volume of argon.

20. The method of claim 14, wherein the plasma comprises between about 25% and about 75% by volume of argon.

21. The method of claim 1, wherein the plasma is generated by delivering a power level of between about 10 watts and about 500 watts to the processing chamber.

22. The method of claim 8, wherein the plasma is generated by delivering a power level of between about 10 watts and about 500 watts to the processing chamber.

23. The method of claim 14, wherein the plasma is generated by delivering a power level of between about 10 watts and about 500 watts to the processing chamber.--

REMARKS

This is intended as a full and complete response to the Office Action dated February 17, 2000. Claims 1-17 were considered and stand rejected by the Examiner. New claims 18-23 are presented for consideration by the Examiner. Applicants assert no new matter has been introduced in this amendment.

Claim 4 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Claim 4 has been amended to provide proper antecedent basis.

Claims 1-17 stand rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over co-pending U.S. Application Serial No. 09/309,606 (hereinafter Application No. 09/309,606) in view of *Komura et al.*, U. S. Patent No. 5,423,941

(hereinafter *Komura*). The Examiner has asserted that it would have been obvious to modify Application No. 09/309,606 by adding the step of increasing the flow rate of helium taught in *Komura* to increase the etching rate. Applicants respectfully traverse this rejection on grounds that Application No. 09/309,606, neither alone nor in combination with *Komura*, teaches, shows, or suggests the claimed invention.

Applicants acknowledge the Examiner's provisional double patenting rejection regarding Application No. 09/309,606. However, as the rejection is provisional, Applicants will file a terminal disclaimer, if appropriate, with regard to any claims allowed by the Examiner. Additionally, U.S. Patent Application Serial Nos. 09/378,364 and 09/388,989 have been filed which contain the same or substantially the same invention as in Application No. 09/309,606.

The prior art has disclosed pre-cleaning patterned substrates with a plasma of argon and hydrogen, however, such pre-cleaning plasmas have been observed to have a low etch rate. The prior art does not teach, show, or suggest a single plasma comprising argon, helium, and hydrogen to achieve the surprising increase in the etch rate of the claimed invention as compared to plasmas of argon and hydrogen.

Application No. 09/309,606 discloses a process for improving metal deposition on a patterned dielectric layer comprising cleaning the patterned dielectric layer in a processing chamber with a first plasma comprising predominantly argon, and cleaning the patterned dielectric layer in the processing chamber with a second plasma consisting essentially of hydrogen and helium. The first plasma removes deposits by a sputter etch cleaning process. The second plasma creates a reactive hydrogen plasma environment to reduce oxides and further clean the exposed features. Application No. 09/309,606 does not teach, show, or suggest processing a substrate by exposing a patterned substrate surface to a plasma comprising argon, helium, and hydrogen to remove contaminants from the patterned substrate surface as recited in the claims. There is no suggestion or motivation in Application No. 09/309,606 to form a single plasma comprising argon, helium, and hydrogen to achieve the surprising increase in the etch rate of the claimed invention. Further, Application No. 09/309,606 does not teach, show, or suggest increasing the helium content of a plasma to increase etching of a substrate surface as recited in claims 4, 8, and 14, and claims dependent thereon.

Komura discloses etching a silicon containing substrate by a dry etching process using a

gas mixture comprising a bromine containing gas, a halogen gas, such as chlorine, and a reactive gas, such as oxygen. *Komura* does not teach, show, or suggest processing a substrate by exposing a patterned substrate surface to a plasma comprising argon, helium, and hydrogen. Further, contrary to the position of the Examiner that *Komura* teaches increasing the helium flow rate to increase an etching rate, *Komura* teaches increasing the flow rate of a reactive oxygen gas, which may contain helium, to increase deposition of silicon oxide on the substrate to reduce the etching rate of an silicon oxide mask disposed on a silicon substrate. There is no suggestion or motivation in *Komura* that an increase in the helium content of a plasma will increase the etching of a substrate surface.

Neither Application No. 09/309,606 nor *Komura*, alone or in combination, teaches, shows, or suggests, a plasma comprising argon, helium, and hydrogen. There is no suggestion or motivation in Application No. 09/309,606 or *Komura* to process a substrate by exposing a patterned substrate surface to a plasma comprising argon, helium, and hydrogen in a processing chamber. Additionally, neither Application No. 09/309,606 nor *Komura*, alone or in combination, teach, show, or suggest increasing the helium content of a plasma comprising argon, helium, and hydrogen, to increase the etching of a substrate surface as recited in claims 4, 8, and 14, and claims dependent thereon. Therefore, the combination of Application No. 09/309,606 and *Komura* do not teach, show, or suggest the claimed invention and withdrawal of the rejection is respectfully requested.

The PCT Search report dated 03/24/00 cited two references as being of particular relevance is disclosing the novel aspects of the invention, however, Applicants believe the invention is patentable over the cited references. *Mei* (U.S. Patent Number 5,043,299), teaches the use of a cleaning gas containing hydrogen in an inert carrier gas, which can include argon or helium, to remove oxide deposits on a tungsten surface. EP 0489779 teaches the use of a plasma of hydrogen and argon or helium to remove oxides from the surface of a substrate. Neither *Mei* nor EP 0489779, alone or in combination, teach, show, or suggest using a plasma comprising argon, helium and hydrogen to clean a silicon based material. There is no suggestion or motivation in *Mei* or EP 0489779 to form a single plasma comprising argon, helium, and hydrogen to achieve the surprising increase in the etch rate of the claimed invention. Further, Neither *Mei* nor EP 0489779, alone or in combination, teach, show, or suggest that an increase in

the helium content of a plasma can increase etching of a substrate surface as recited in claims 4, 8, and 14, and claims dependent thereon.

Yanagida, U.S. Patent No. 5,726,097, which discloses employing plasma containing helium and argon to clean a metal, and *Tatsumi*, U.S. Patent No. 5,266,154, which discloses a dry etching method using a plasma containing inert gases, are made of record and are noted as not being used as a basis for rejection of the claims asserted by Applicant. Neither reference, alone, or in combination with any reference of record, teaches, shows, or suggests processing a substrate by exposing a patterned substrate surface to a plasma comprising argon, helium, and hydrogen. It is believed that the secondary references are no more pertinent to the Applicants' disclosure than the primary references cited in the office action. Therefore, it is believed that a detailed discussion of the secondary references is not deemed necessary for a full and complete response to this office action. Accordingly, allowance of the claims is respectfully requested.

In conclusion, the references cited by the Examiner, neither alone nor in combination, teach, show, or suggest the claimed invention. Having addressed all issues set out in the office action, Applicants respectfully submit that claims 1-23 are in condition for allowance and respectfully request that claims 1-23 be allowed.

Respectfully submitted,

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